

4WD-RCRA

MEMORANDUM

SUBJECT: Media Cleanup Standards and Conditional Remedies in the
HSWA Program

FROM: Corrective Action Standing Team
Remedy Selection Subteam

THROUGH: G. Alan Farmer, Chief /s/ February 29, 1996
RCRA Branch

TO: RCRA Staff

ISSUE

During implementation of the corrective action program covered by the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA), the United States Environmental Protection Agency (EPA) - Region 4 has encountered numerous questions regarding media cleanup standards and implementation of remedial alternatives. Attached is final guidance developed by the EPA Region 4 Remedy Selection Subteam of the Corrective Action Standing Team to address the above questions. Specifically, the guidance addresses the setting of final media cleanup standards and the opportunities for implementing proposed Subpart S through conditional remedies.

The guidance on conditional remedies should be used in such cases where a conditional remedy is deemed appropriate. However, it is a site-specific decision to be made by the facility coordinator whether to use a conditional remedy or not. In several instances a conditional remedy might not be appropriate. For example, if a facility wishes to move a SWMU to the status of no further action with unrestricted use, a full conditional remedy might not be appropriate.

Conditional remedies accord well with stabilization activities. The remedies selected as conditional remedies are similar to those conducted under stabilization. Two major differences exist. First, because conditional remedies occur later in the corrective action pipeline (i.e., at remedy selection after the CMS), an Agency-initiated permit modification or public notice of a Statement of Basis for an order is required. This allows for public participation, which is often missing with stabilization. Second, areas which exhibit low levels of contamination, which are not often dealt with in stabilization, are addressed, either through active or passive remediation or through institutional controls.

This guidance was written to provide general guidelines for setting final media cleanup standards and implementing conditional remedies. Each site may pose individual questions, all of which cannot be answered in one guidance document. For these individual questions, the facility coordinator is encouraged to request guidance from the Corrective Action Standing Team, if necessary. Additionally, because conditional remedies often make use of risk assessments and risk-based remediation goals, facility coordinators should also refer to the Corrective Action Standing Team's memorandum on risk assessments in the HSWA program. Though the attached guidance recommends the development of risk-based concentrations to demonstrate protection of human health and the environment based on current exposure, as pointed out in the risk assessment memorandum, EPA expects there to be cases where the proposed remedial alternative limits or completely eliminates exposure(s) without the need to establish specific numerical remedial goals (i.e., cleanup levels). In such cases risk-based goals may need not be developed.

EXAMPLE CONDITIONAL REMEDY

The use of conditional remedies is being exercised in Region 4. Most recently a conditional remedy was public noticed which entailed capping the soil in place for use as a parking lot and natural attenuation and monitoring of the groundwater. As discussed above, because each remedy will entail site-specific decisions not expressly addressed in the attached guidance, also attached is the Statement of Basis for the conditional remedy described above. This Statement of Basis may aid in giving a better indication of some of the site-specific decisions involved in a conditional remedy.

DISCLAIMER

This memo is intended to be a regional interpretation of how to set final media cleanup standards and how to implement conditional remedies. Nothing in this memo is intended to change or supersede future corrective action regulatory requirements. The proposed Subpart S rule is currently under review and a re-promulgation of the rule or a revision of the rule is due soon. If any provisions of the revisited Subpart S rule are in conflict with this guidance, then the final regulations will take precedent. The policies and procedures established in this document are intended solely for the guidance of employees of EPA. The policies and procedures are not intended and cannot be relied upon to create any rights, substantive or procedural,

enforceable by any party in litigation with the United States. EPA reserves the right to act at variance with these policies and procedures and to change them at any time without public notice.

Attachments

MEDIA CLEAN-UP STANDARDS AND CONDITIONAL REMEDIES

Executive Summary

Several questions have arisen regarding the selection of media clean-up standards and the use of conditional remedies. Though these questions apply to various media, they have arisen particularly with respect to their applicability to groundwater. The proposed rule for Corrective Action for Solid Waste Management Units at Hazardous Waste Facilities (proposed S rule) (FR, Vol. 55, July 27, 1990) was evaluated to provide preliminary guidance on these issues.

Based on an evaluation of the proposed Subpart S rule, it is recommended to develop conservative health-based media clean-up standards within a 10^{-6} to 10^{-4} risk range for carcinogens, assuming a residential scenario. For groundwater and surface water that are current or potential sources of drinking water, MCLs should be considered, where available. The conservative media clean-up standards should be developed to reflect all potential exposure pathways (*e.g.*, ecological risk associated with contaminated surface water or sediment, contaminated soil acting as a contaminant source, etc.) These conservative media clean-up standards are used for final “walk away” clean-up which has no deed notifications, institutional controls, etc. If risk evaluations are used to deviate from these conservative media clean-up standards, then the remedy selected will not be “final” but conditional.

These are certain instances where HSWA corrective action may be deferred for a release from a solid waste management unit (SWMU) or area of concern (AOC), even if the release is above conservative media clean-up standards. These include: 1) areas of broad contamination, where any remediation of a SWMU or SWMU area would be conducted in conjunction and consistent with on-going, area-wide remediation; 2) groundwater that is not a current or potential source of drinking water (*i.e.*, a Class III aquifer or state equivalent) and that is not hydraulically

connected to waters, either groundwater aquifers or surface water, where hazardous constituents would migrate at concentrations greater than conservative media clean-up standards; and 3) remediation of the media of concern is technically impracticable. Variants of these instances may be determined on a case-by-case basis. In these instances the level of protection has not been lessened, as either remediation will take place on a community-based project; exposure is unlikely and/or limited due to inherent limitations on the use of the resource; or remediation will continue when appropriate technology becomes available.

Proposed Subpart S also allows for “conditional remedies.” If certain conditions are met, conditional remedies allow the owner/operator to phase-in a remedy or remedies over time. Under conditional remedies existing contamination (sometimes at existing concentrations) within the facility boundary can remain unremediated for a period of time, provided certain conditions are met. However, conservative media clean-up standards must be met for any releases that have migrated beyond the facility. Again, though remediation may be phased in over time in a conditional remedy, the final clean-up goals (*i.e.*, compliance with conservative media clean-up standards) have not changed. Rather the attainment of these goals has been delayed.

The selection of final remediation, no further action or conditional remedies varies on a site-specific and media specific basis. Generally, it is anticipated that for soil, a conditional remedy, which would allow clean-up to other than the conservative media clean-up standards (*e.g.*, industrial scenarios) provided certain conditions are met, will be the most likely scenario used. The determination of an appropriate option for groundwater is based on the fact that groundwater has “intrinsic qualities” which need preservation. Therefore, EPA must protect groundwater as a natural resource. As a resource, the level of protection is dependent on whether the groundwater is a potential drinking water source, whether the plume is within the facility boundary, and the hydrogeologic nature of the site. As discussed above, for groundwater that is not a potential drinking water source, a level of protection is maintained because contamination

is contained within the facility boundaries, and the affected aquifer, which is not a potential drinking water source, is not discharging into an aquifer that is a potential drinking water source or into a surface water body. Circumstances where a conditional remedy might apply are discussed below.

Existing Framework - Proposed Subpart S

Media Clean-Up Standards: The July 1990, Proposed Subpart S rule addresses the selection of media clean-up standards and provides criteria for adopting some type of no further action decision or conditional remedy. For establishing media clean-up standards, proposed §264.525(d) provides the methodology for establishing health-based concentrations as media clean-up standards. Point of departure for carcinogens should be 10^{-6} risk, but the clean-up standard should not exceed 10^{-4} . The clean-up standard for systemic toxicants are based on a life-time exposure. These health-based media clean-up standards generally address exposure through ingestion. Additionally, media clean-up standards must address any route of exposure (*e.g.*, effects of soil on groundwater and subsequent groundwater exposure, ecological exposure to surface water/sediment, inhalation pathways, etc.) present at the site.

In addition as per proposed §264.525(d)(1)(iv), Maximum Contaminant Levels (MCLs), including any state MCLs which may be more stringent than federal MCLs, shall be considered in establishing media clean-up standards for groundwater and surface water that are potential drinking water sources. Though not specifically stated in the proposed Subpart S regulations, the preamble discusses generally using the approach outlined in the EPA's Ground-Water Protection Strategy (August 1984 and subsequently updated) for determining if groundwater is a current or potential source of drinking water (*e.g.*, Class I and II versus Class III aquifers).

These clean-up goals would be developed using conservative exposure assumptions, which would allow a facility to “walk away” from residual contamination at a SWMU, and would apply to a final clean-up. Thus the establishment of final media clean-up standards are based on conservative exposure assumptions, both present and future, site-specific migration pathways and MCLs, where applicable. These standards allow the facility to walk away from the SWMU after remediation. Exhibit 1 presents a general outline for the establishment of these conservative media clean-up standards.

No Further Action and Remediation Deferment: No further action decisions may occur at several instances throughout the corrective action process. The most obvious is at the end of Confirmatory Sampling or the RCRA Facility Investigation where no release or no contamination greater than “action levels” has been detected. Additionally, during the Corrective Measures Study proposed Subpart S outlines instances where a determination is made that remediation may be deferred, even though releases occurred above any conservative media clean-up standards, as outlined above. Specifically for groundwater, if the constituent(s) is present in groundwater that is not a current or potential source of drinking water (*e.g.*, Class III aquifer), and is not hydraulically connected with waters to which the hazardous constituents are migrating or likely to migrate in a concentration(s) greater than an action level, MCL or surface water standard, where appropriate, remediation is not required. However, in this case there needs to be assurance that the groundwater is not nor will be a source of drinking water. Also, in broad areas of contamination (*e.g.*, highly industrialized areas with significant contamination), remediation may not be required as EPA does not believe the corrective action program’s objective is to result in “islands of purity.” In these instances remediation would be conducted in conjunction and consistent with any on-going area-wide remediation. Variants of these instances may be determined on a case-by-case basis.

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EXHIBIT 1 Development of Media Clean-Up Standards

Conditional Remedies: Proposed Subpart S also provides the flexibility for conditional remedies. These allow the owner/operator to phase-in the remedy over time. In essence these remedies would allow existing contamination (sometimes at existing concentrations) to remain within the facility boundary for a period of time, provided certain conditions are met. With a conditional remedy media clean-up standards throughout the plume are still set to MCLs or equivalent health-based concentrations for the particular media of concern, but remediation to these numbers is not required at this time. It should be noted that though remediation may be phased in over time in a conditional remedy, the final clean-up goals (*i.e.*, conservative media clean-up standards) have not changed. Rather the attainment of these goals has been delayed. Though the time frames of conditional remedies are determined on a site-specific basis, the permit or order should remain in effect for at least the length of the time frame of a conditional remedy . Prior to permit or order termination, a decision regarding the final remedy must be made.

As stated in proposed Subpart S, a conditional remedy may be selected if the following criteria are met: 1) the conditional remedy is protective of human health and the environment (based on current exposure); 2) the Permittee shall remediate to the media clean-up standards (*e.g.*, MCLs) for any contamination that has left the facility boundary; 3) the remedy prevents further significant degradation of the environmental media through treatment and/or engineering methods as necessary (*i.e.*, control of releases from source *and* control of the further migration of a release within the facility boundary); 4) monitoring is continued to determine if significant degradation occurs; 5) institutional or other controls are instituted to prevent significant exposure; 6) financial assurance for the conditional remedy is provided; and 7) the Permittee complies with standards for management of wastes. If each of these criteria are met, then final remediation to conservative media clean-up standards is not necessarily required at the present time, but may be delayed until current exposure changes.

Summary: As noted, though final media clean-up standards are conservative, proposed Subpart S allows for flexibility in implementing environmental remediation. It is anticipated that in most instances, a combination of final remedies, conditional remedies and potentially no further actions will occur at a facility, based on site and SWMU conditions and media-specific information. The determination of the best combination of these options is highly site specific. However, it is anticipated that conditional remedies will probably be the most appropriate way to address existing on-site contamination for soils, as the areal extent of the contamination is generally well defined, and RCRA facilities will generally remain industrial facilities. The remediation of surface water and sediment will be driven by site-specific conditions, particularly ecological risk and the potential for off-site migration. Conditional remedies may apply to groundwater. However, given the nature of groundwater (*e.g.*, intrinsic properties, potential to migrate off-site, etc.), closer evaluation of the applicability of a conditional remedy will be required, and it is likely that more controls and conditions will be necessary to implement a conditional remedy for groundwater versus for soil. The use of conditional remedies will not lessen the protection of human health and the environment, as current exposures are addressed, and future exposures will be addressed if and when they arise.

Conditional Remedies for Groundwater

As discussed above, several conditions must be met to select a conditional remedy at a RCRA facility. It must be determined that the land use in the vicinity of the facility supports the use of a conditional remedy (*e.g.*, the facility is zoned industrial/commercial, etc.). Land use should be such that current exposure is limited and can be controlled. The specific conditions for implementation, as listed in Table 1, are as follows: 1) the conditional remedy is protective of human health and the environment (based on current exposure); 2) the Permittee shall clean up to the conservative media clean-up standards (*e.g.*, MCLs) for any contamination that has left the facility boundary; 3) the remedy prevents further significant degradation of the environmental

TABLE 1 - Conditional Remedy Criteria

Criteria No. Criteria

- 1 The conditional remedy is protective of human health and the environment (based on current exposure)
- 2 The Permittee shall clean up to the conservative media clean-up standards (*e.g.*, MCLs) for any contamination that has left the facility boundary
- 3 The remedy prevents further significant degradation of the environmental media through treatment and/or engineering methods, as necessary (*i.e.*, control of releases from source *and* control of further migration of a release within the facility boundary)
- 4 Monitoring is continued to determine if significant degradation occurs
- 5 Institutional or other controls are instituted to prevent significant exposure
- 6 Financial assurance for the conditional remedy is provided.
- 7 The Permittee complies with standards for management of wastes

media through treatment and/or engineering methods, as necessary; 4) monitoring is continued to determine if significant degradation occurs; 5) institutional or other controls are instituted to prevent significant exposure; 6) financial assurance for the conditional remedy is provided; and 7) the Permittee complies with standards for management of wastes.

For a conditional remedy the protection of human health and the environment would be determined based on “risk-reduction concentrations,” which are developed based on existing current human exposures and an evaluation of any long term adverse impacts to the environment. For example, the exposure scenario for humans to soil at an industrial site might reflect what type of exposure would be expected in that scenario rather than a residential scenario. However, as the second criteria listed above indicates, the conservative media clean-up standards (*i.e.*, MCLs or equivalent health-based concentrations for the appropriate media) would apply to off-site contamination. Thus, in instances where a groundwater plume has migrated off site, remediation of this off-site contamination to conservative media clean-up standards is required.

For groundwater compliance with criteria #1 is determined by monitoring compliance with the risk-reduction concentrations. In addition, compliance with criteria #1 includes the facility initiating measures to ensure that the assumptions of exposure, on which the risk-reduction concentrations are based, are met. For example, if it is assumed that drinking water wells will not be installed on site, the facility must initiate measures to ensure that no such wells are installed. Monitoring wells will need to be designated to demonstrate compliance with the risk-reduction concentrations. It is likely that these wells may be the same as the point-of-compliance (POC) wells for a final remedy. Proposed Subpart S outlines several alternatives for the POC, including the physical edge of the SWMU or SWMU area, throughout the plume, the leading edge of the plume, if contained within the property, or the facility boundary. Though the appropriate placement of the POC wells for final remedy is still under discussion and is a site-specific decision, proposed Subpart S regards, and EPA Region 4 concurs, that the use of the

facility boundary as a POC is inadvisable. This is because locating the POC wells at the facility boundary will allow the increased degradation of the groundwater in cases where the groundwater plume has not reached the property boundary, which would potentially make final remedial goals more difficult to attain. It is recommended that for final remedies the POC be set at the physical edge of the SWMU or SWMU area. However, as mentioned above, this is a site-specific decision. This POC may be used to determine compliance with the risk-reduction concentrations for the conditional remedy and would be used to demonstrate compliance with the media clean-up standards for the final remedy. That is, while the conditional remedy is on-going, the POC wells would be used for monitoring compliance with the risk-reduction concentrations; at the time of the final remedy (*e.g.*, facility closing), the POC wells would be used to monitor compliance with the conservative, residential media clean-up standards (*e.g.*, MCLs).

In addition to the POC wells discussed above, additional monitoring wells located in the vicinity of the downgradient property boundary (usually some distance within the property boundary to provide a buffer) will need to be sampled to verify that off-site migration above the conservative, residential media clean-up standards is not occurring. This monitoring will provide demonstration of the compliance with criteria #2.

The third criteria for a conditional remedy is prevention of further significant degradation of an environmental media. The “further significant degradation of environmental media” is generally defined as releases of contaminants to the environment above action levels and/or MCLs for each migration/exposure pathway. The prevention of further degradation includes addressing both the original source of contamination and also the continued migration of the release. For groundwater the source of the plume can consist of both soil contamination acting as a source and the original source of existing groundwater contamination. Determination that potential further degradation of the environment is occurring requires on-going monitoring, as stated in criteria #4, and may require treatment and/or engineering controls. Monitoring of an

existing plume should occur at or near the downgradient edge of the groundwater plume. Containment systems (*e.g.*, pump-and-treat, interceptor trenches, etc.) are necessary to control the migration of elevated groundwater contamination. The success of this containment system may also be monitored through a set of monitoring wells, located at or near the downgradient, non-detect edge of the groundwater plume and outside of the containment system. In instances where it appears that there is increased degradation (*i.e.*, plume is not contained, as is) of the environmental media, additional treatment and/or engineering controls (*e.g.*, source removal, groundwater containment, active remediation, etc.) may be required.

Many types of remediations may be used as a conditional remedy for groundwater, as long as the criteria in Table 1 are met. A particular category of remediation includes the use of natural attenuation. Natural attenuation, which is considered a passive remediation, is defined as dilution, dispersion, adsorption or biological degradation of contamination within the groundwater medium. With natural attenuation the attenuation of contaminants to risk-reduction concentrations during a conditional remedy, and ultimately to MCLs of equivalent for the final remedy, will occur over an extended period of time. To utilize natural attenuation, the contaminated soils, which may act as a source of leachate to the groundwater, and any free product must be removed. In addition the hydrogeology of the site needs to be well characterized. There also should be some indication of the propensity of the constituents of the contaminated plume to attenuate naturally. In addition the contaminated groundwater would not likely become a source of drinking water in the future because of the distance from any population or other factors. In these instances proposed Subpart S allows remediation to occur over an extended period of time, with natural attenuation (*i.e.*, physical diffusion, chemical binding or chemical and/or biological degradation) being a major factor in the remedy. Thus, in instances where an on-site plume is fairly isolated and a sufficient distance from the facility boundary, the monitoring of the degradation of the environment may factor in natural attenuation

before requiring additional remediation and/or containment. However, performance standards will need to be determined to evaluate the effectiveness of the natural attenuation.

Exhibits 2 and 3 depict two potential configurations of a conditional remedy and required monitoring. First is a situation where containment is used; second is a situation of an isolated plume where natural attenuation is being evaluated. In both instances the POC at the SWMU boundary is used to monitor compliance with risk-reduction concentration (RRCs). These concentrations are developed based on existing current exposure. Also, a set of wells near the facility boundary is designated to determine if contamination is migrating off site. If so, this contamination must be remediated to MCLs or equivalent health-based concentrations. Last, additional monitoring is required downgradient of the plume. In Exhibit 2, this set of monitoring wells monitors the effectiveness of the containment system and any degradation of the groundwater. For Exhibit 3 this set of monitoring wells monitors natural attenuation and any degradation of the groundwater. Based on the data from this third set of wells, in both situations, additional source control, groundwater containment or groundwater remediation may be required to prevent further degradation.

The remaining factors for implementation of a conditional remedy include institutional controls, financial assurance and waste management practices. Institutional controls may include deed notifications, fencing and posting of areas. These controls are utilized to limit exposure to residual contamination. Inspections and maintenance may be required for some for the institutional controls, such as fencing. Other institutional controls are currently under consideration. The requirements for financial assurance are also under consideration, but may possibly be similar to the financial assurance requirements under a post-closure care permit. Last, the facility must comply with appropriate waste management regulations and practices during the implementation of a conditional remedy. Exhibit 4 presents a flow chart which indicates the

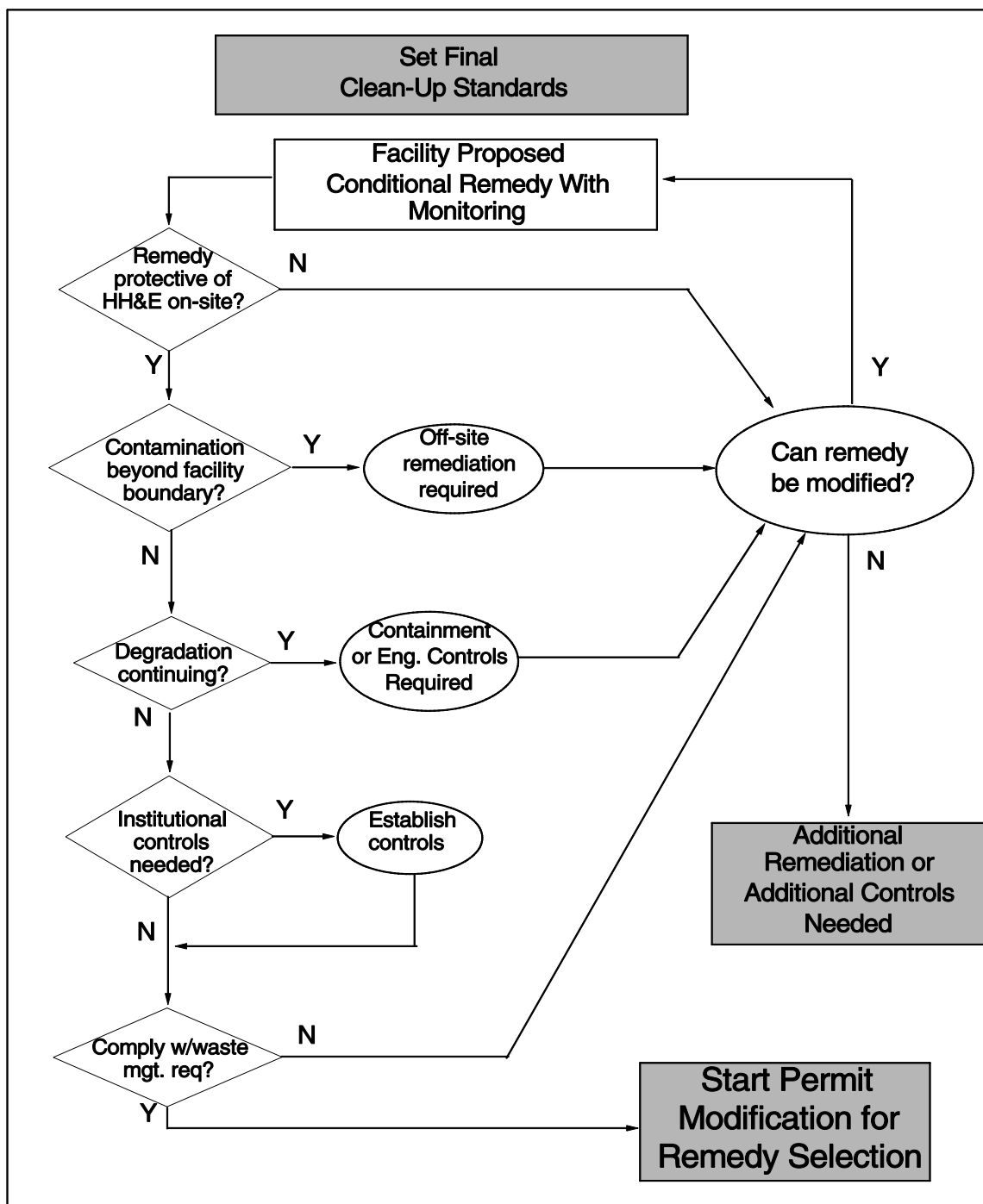


Exhibit 4 - Conditional Remedy Decision Flow Chart

decision process for selecting a conditional remedy. Exhibit 5 presents a similar flow chart for the evaluation of data from monitoring required for the implementation of a conditional remedy.

To implement a conditional remedy, the following conditions, at a minimum, will need to be included at the time of the permit modification or development of a Statement of Basis for a 3008(h) order. These conditions include: 1) conditions listing the conservative media-specific standards for final clean-up and for off-site contamination during the conditional remedy; 2) conditions listing the risk-reduction concentrations for the conditional remedy, which also lists or references the assumptions used in developing these concentrations; 3) conditions outlining the remedy itself, including any operation and maintenance and inspection requirements (such as inspection of fences to assure effectiveness of the institutional controls); 4) conditions requiring submittal of reports, such as periodic effectiveness reports or monitoring/progress reports; 5) conditions allowing for reopening the remedy selection process either due to the effectiveness of the chosen remedy (or lack thereof) or due to a change in the assumptions used to develop the risk-reduction concentrations (hence resulting in the remedy not being protective); 6) conditions that allow periodic review (*e.g.*, every five years) by the implementing agency of the remedy (both for effectiveness and protectiveness); 7) conditions that require deed notifications; and 8) conditions which include requirements for complying with standards for management of waste.

Redevelopment of Subpart S

Several aspects of proposed Subpart S are currently undergoing evaluation for the re-proposal of the rule. This evaluation includes, among other things, examining land use issues, the use of risk assessments (including ecological risk assessments), location of the POC for final remedies, institutional controls, remedy selection and clean-up goals. As more information is gathered and examined during these evaluations, the strategy outlined above might necessarily

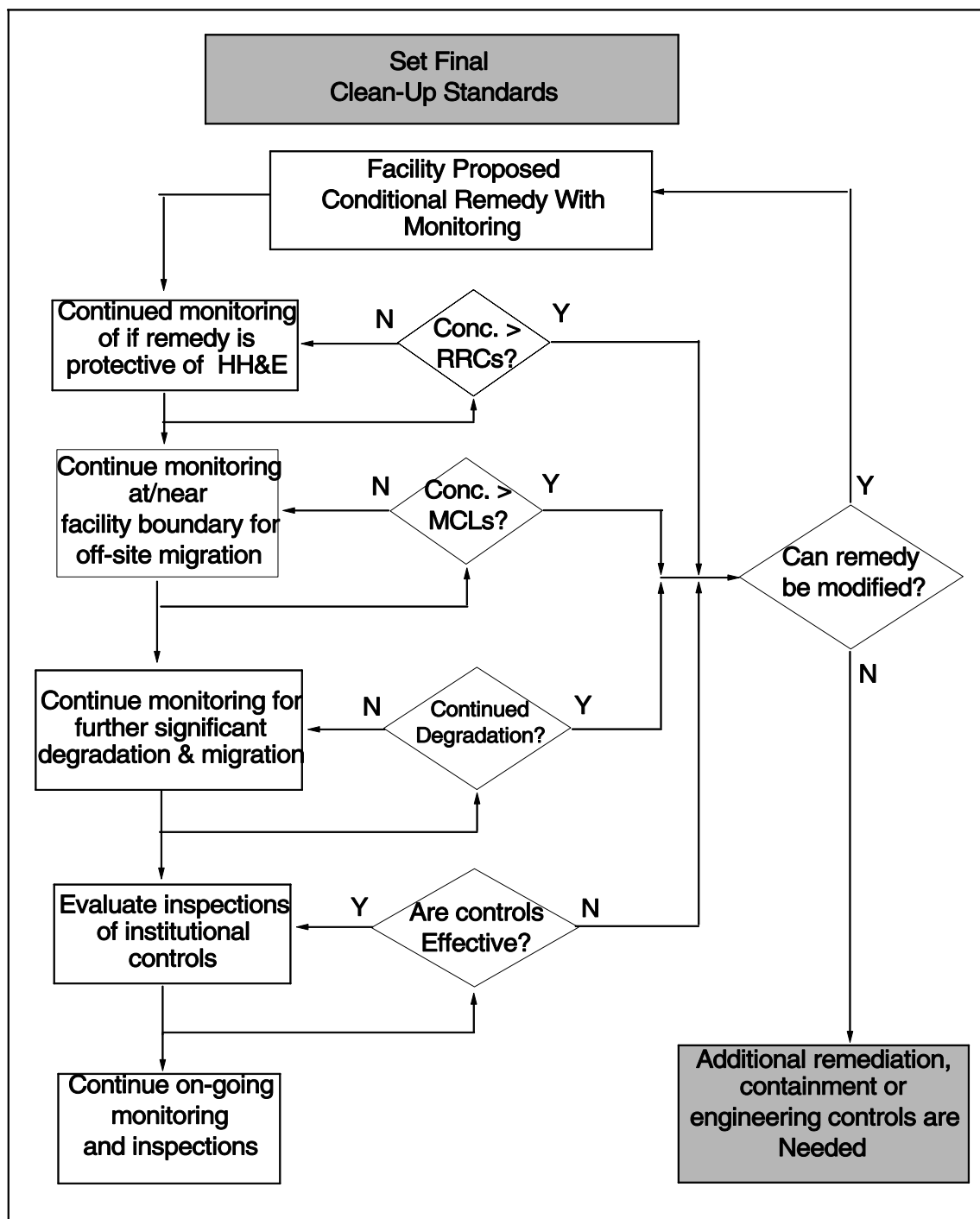


Exhibit 5 - Conditional Remedy: Evaluation of Monitoring Data

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change. As with many aspects of corrective action under HSWA, this strategy will continue to be evaluated to assure adherence to any new guidance or policy that results from the evaluation of the proposed Subpart S rule.